Docket No.: USS-18302/16

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Subhendu Guha et al.

Application No.: 10/765,435 | Confirmation No.: 1518

Filed: January 27, 2004 | Art Unit: 2822

For: METHOD FOR DEPOSITING HIGH-QUALITY MICROCRYSTALLINE SEMICONDUCTOR MATERIALS | Examiner: T. Y. Tran

REPLY BRIEF

MS Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In his answer, the Examiner has raised new arguments, some of which are based on newly cited teachings of the Guha et al. reference. Appellant will take this opportunity to address these arguments which, as Appellant will demonstrate, are based upon a misreading of both Applicant's claims and the actual teachings of the reference.

Specifically, at the top of page 7 of his answer, the Examiner points out that the claim is in a Jepson type format and asserts:

> Therefore, the invention comprises what is written in the last two lines of the claim, specifically:
>
> "varying the concentration of the diluent in said process gas as a function of the thickness of the layer of microcrystalline semiconductor material which has been deposited".

In other words, the Examiner has chosen to simply read the preamble of claim 1 right out of the claim, which he is, of course, not permitted to do. It is trivially true that the preamble of a Jepson format claim defines the state of the prior art, with the body of the claim representing the

advance the invention represents over that prior art. However, it is absolutely incorrect to say that "therefore, the invention comprises what is written in the last two lines of the claim ..." as the Examiner has incorrectly done. It is the entire claim which defines the invention, and the Examiner is not permitted to read out the preamble.

The Board will note that the preamble of claim 1 specifically defines the prior art as "a process for the plasma deposition of a layer of microcrystalline semiconductor material" in which the plasma created in the deposition process "deposits a layer of said microcrystalline semiconductor material onto a substrate." From this preamble, it is abundantly clear that the claim is confined to the process of plasma deposition of a microcrystalline semiconductor layer. According to the body of the claim, the thickness of the layer of microcrystalline semiconductor material is used to vary the concentration of the diluent in the process gas used in the deposition process.

Therefore, from the interaction between the preamble of the claim and its body, the conclusion is inevitable that the claim is solely confined to an improved process for the plasma deposition of a microcrystalline semiconductor layer and not any plasma deposition process which involves the deposition of an amorphous layer of semiconductor material.

Of course, it is the deposition of an amorphous layer of semiconductor material to which the Guha et al. reference is exclusively devoted. There is no teaching in the reference of depositing a layer of solely microcrystalline material.

The Examiner purports to find such a teaching in lines 5-8 of column 5 of the reference. However, the Examiner is obviously reading this teaching completely out of context. To drive home this point, Appellant will cite this passage in its entirety:

> In another aspect of the present invention, the theorized templating action of a layer may be employed to fabricate a highly ordered layer of thin film semiconductor material, such as a highly microcrystalline layer, under conditions which might otherwise not permit the deposition of a layer having that degree of order. This ability can be useful in the circumstances wherein other portions of a device structure would be harmed by deposition conditions employed to manufacture a highly ordered layer ab initio. (Column 5, lines 5-12)

This all relates to what is described in the Guha reference as "templating." As described, the slightly ordered portions of an amorphous layer serve as a template for the deposition of a more ordered material, which in turn nucleates the deposition of a microcrystalline material. As a result, process conditions which initially favor deposition of an amorphous material will eventually yield a more crystalline material. Hence, the amorphous/microcrystalline threshold will vary as a function of the amount of material already deposited, and the Guha reference teaches that process conditions must be varied so as to keep the depositing material in the amorphous region.

First, the teaching of the passage cited by the Examiner clearly requires that the deposition of a microcrystalline layer is not done "ab initio" (in other words, a layer of amorphous semiconductor material has already been deposited in accord with the teachings of the reference as a whole), and this is made abundantly obvious by the reference in lines 5 and 6 of the passage to "the theorized templating action of a layer" (in other words, the templating action of the amorphous layer already deposited). Secondly, the statement in this passage that the deposition of a microcrystalline layer atop an existing amorphous layer may be done "under conditions which might otherwise not permit the deposition of a layer having that degree of order." This is completely consistent with the rest of the reference which teaches that, in order to deposit a layer of amorphous material, the deposition conditions:

> may be initially set to a point below the threshold for the deposition of microcrystalline semiconductor material; and as subsequent portions of a layer build up, these deposition conditions can be further varied to a point below the initial threshold setting so that the degree of order of the depositing layer remains essentially constant throughout its thickness. (Column 4, lines 59-65)

In other words, the reference teaches maintaining the deposition parameters so as to keep to the amorphous side of the amorphous/microcrystalline boundary during at least the initial deposition process. In most cases, the reference also teaches the entire layer is deposited as amorphous material. However, the reference also teaches that it might be possible to have some layer later deposited portions of a layer be microcrystalline under conditions otherwise unsuited to the deposition of microcrystalline material by taking advantage of "the theorized templating action" of a layer (rather sublayer) of the amorphous material already deposited.

This theorized templating action is described in column 3, lines 46-59 of the reference:

> While Applicants do not wish to be bound by speculation, it is theorized that the ordering in the body of thin film semiconductor material improves as the layer is deposited, as a result of a templating effect. In a templating effect, a freshly deposited surface of semiconductor material provides a template which supports and fosters growth of subsequent layers of semiconductor material thereupon. The ordering of the subsequently deposited layers is generally better than that of the surface which forms the template, since subsequently depositing layers will preferentially align with, and be guided into conformation by, those portions of the templating layer manifesting good order. Consequently, Applicants theorize that the ordering of the depositing body of thin film semiconductor material improves as a function of layer thickness.

In other words, the Guha reference recognizes that, under normal conditions, the semiconductor material tends to become more orderly as the layer thickness increases as an artifact of the plasma deposition process. The invention claimed in the Guha reference is a recognition that, by carefully controlling the deposition conditions the amorphous/microcrystalline threshold can be

controlled in order to keep the deposition process on the amorphous side of the amorphous/microcrystalline boundary, thereby countering the normal templating effect. More specifically, the thickness of the layer being deposited is used to control at least one of the parameters to achieve the desired effect of amorphous deposition.

Therefore, the passage cited by the Examiner in column 5, lines 5-8 is emphatically not a teaching of depositing a layer of **microcrystalline** semiconductor material from scratch ("ab initio"). Rather, it is a teaching of using the templating effect just described during a deposition process in which the deposition parameters are otherwise selected to strongly favor amorphous material deposition in order to create a more profiled or structured composite layer containing both amorphous and microcrystalline sublayers.

Now that Appellant has explained the actual teachings of the Guha reference, it should be recognized that the present invention represents a great and surprising advance over the prior art. Given that the reference teaches controlling the process parameters of the deposition process to achieve amorphous deposition, it would not be expected that similar techniques could be employed to achieve the deposition of microcrystalline material. Yet, this has proven to be the case. By carefully controlling the deposition parameters to keep the process to the microcrystalline side of the amorphous/microcrystalline boundary, again employing layer thickness as a means of doing so, Appellant has achieved something both novel and unexpected over the prior art.

Accordingly, the Examiner's focus on a few scant lines of the reference has distracted him from the reference's actual teachings, taken as a whole. Furthermore, he has mischaracterized the claims on appeal by impermissibly determining that, merely because they are Jepson claims, it is somehow acceptable to ignore the preamble, when the law is very clear

that claims must be read in their entirety. Replete as it is with both factual and legal errors, the Examiner's conclusions of unpatentability are totally without merit and must be reversed.

Dated: July 2, 2007

Respectfully submitted,

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